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Geological controls on variable gas concentrations: A case study of the northern Gujiao Block, northwestern Qinshui Basin, China

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Abstract: A systematic investigation was performed on the variation of gas content and its geological controls based on the diverse geological data and the experimental results of 72 coal samples from 24 coalbed methane (CBM) wells in the northern Gujiao Block, NW Qinshui Basin, China. Coal rank varies from low-volatile bituminous coal to medium-volatile bituminous coal, with maximum vitrinite reflectance ($R_{o,max}$) ranging from 1.21 to 1.92%. CBM in the northern Gujiao Block is mainly produced from the relatively thick coal seams (~1.0 m-7.0 m), which are distributed in the Upper Carboniferous Taiyuan formation and Lower Permian Shanxi formation. The total gas content of coal seams ranges from 3.83-16.82 m³/t, with increasing gas content from marginal to central areas. Highly variable gas content reflects the comprehensive effect of various geological factors and coal reservoir properties. The results of the study show that the structural types, roof lithology, burial depth and hydrodynamic conditions are key factors controlling the gas content, whereas coal thickness and coal properties have no or little correlation with the gas content. In the northern Gujiao Block, three geological features controlling gas content are identified: 1) hydrodynamic trapping of gas in the graben structure with an adequate burial depth

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